A. I heard a figure but I don't want to state it because it's not documented, so I would say I don't know for sure.

Q. Well, if I told you it was over 75 hours, does that ring true to what you were told?

A. I heard it was about three days.

Q. Okay. That's pretty long, isn't it?

A. It is.

Q. Is it one of the longest you've ever heard of?

A. No. There are -- autopsies are done a week later.

Q. Okay. But certainly in a true peripheral site like a femoral vein, you would expect there to be postmortem redistribution of digoxin at 70 hours; right?

A. I would.

Q. And would you expect there to be postmortem redistribution of digoxin in an axillary vein at 70 hours?

A. I think it would be in any site.

Q. Okay. Is digoxin lipophilic or lipophobic?

A. It's more lipophilic, but it does have water-soluble characteristics.

Q. Are lipophilic compounds more likely to undergo PMR than lipophobic?

A. Yes.

Q. Are you a member of the AAFS?

A. Yes. American Academy of Forensic Sciences.

Q. Yes.

What is Dr. Middleberg's role at NMS vis-a-vis your own?

A. Well, right now he is the vice president of quality assurance. He still functions as a forensic toxicologist.

Before -- before Dr. Logan came on board, he was in charge of the toxicological services group.

And then when Barry Logan joined us, Rob moved into the QA department, though he still does a lot of forensic tox, and Barry headed up the toxicological services group.

Q. Okay. So I assume in this case you don't know anything about when Mr. McCornack took his last digoxin dose before death?

A. I do not.

Q. Did you help draft the AutoText portions that appear on Page 2 of Exhibit 8?

A. Some of these I was involved in in not directly writing but certainly I had input into the text itself.

Q. Okay. Do you have any --

A. The digoxin, I know I did not work with the digoxin.

But quinidine, atropine, ethyl alcohol, and diltiazem are all part things that I did work over the years.

Q. Is there any one source in the medical literature that is the definitive statement on the quantity by which digoxin will redistribute postmortem at various times?

A. I don't know the answer to that. I haven't seen any specific papers that I know of that would answer that question.

Q. Are --

A. I'm sure there are studies in a limited number of patients that, you know, we can glean information from, but I don't know if it's definitive.

Q. Okay. But you're aware that there's literature that talks about quantity of redistribution; right?

A. Well, certainly.

Q. Or magnitude of redistribution?

A. Well, based on ratios between heart blood, peripheral blood, yes.

Q. Is excess dose the only reason for digoxin toxicity or an elevated serum level?

A. No.

Q. Would you expect there to be more postmortem redistribution at 24 hours than 5 hours?

A. I would expect so.

Q. More at 44 hours than 24 hours?

A. I expect so.

Q. And more at 75 than 44?

A. Unless -- unless we've gotten to a point where, you know, things have stabilized and all the concentrations in the body are the same.

Q. I assume in this case you're not going to render any opinions to a reasonable probability as to what the dose of Mr. McCornack's digoxin was in the days leading to his death.

A. I will not.

Q. You're not going to render any opinions to a probability about the -- what his serum digoxin level would have been had it been drawn prior to his death.

A. No, I would not.

MR. ERNST: I'm going to object to that.

It's incomplete.
BY MR. MORIARTY:
Q. Are you even going to render any opinions to a probability as to the likely range of his serum level prior to death?
A. Well, if I was given a hypothetical question based on his weight and normal body functions in terms of kidney function, et cetera, I could use literature values to give you a ballpark estimate of his antemortem level.
Q. Would that require to use -- you to select some random magnitude of postmortem redistribution?
A. Well, if we're talking about antemortem, there would not be any postmortem redistribution.
Q. I'm sorry, maybe my question was bad.
Would doing such a ballpark estimate require you to assume a magnitude of the postmortem redistribution?
A. No. No. I'm not taking -- I'm not taking a level that we took postmortem and trying to calculate back to antemortem.
What I'm saying is, to be clear, what I would do is if you -- somebody were to give me the -- as much information as you could about the situation

at the time, his body weight, his typical dose, his kidney function being normal, et cetera, things like that, and then based on the literature of volunteers taking digoxin over a certain period of time, I would say the typical range would be from X to Y.

Q. Okay.

A. Okay?

Q. But extrapolating back from postmortem to anti -- antemortem -- a-n-t-e -- mortem, is typically not recommended; correct?

A. It's not recommended. It's fraught with all kind of perils.

Q. And you've even said in other settings that you can make estimates but they are not necessarily accurate estimates; correct?

A. That's correct.

Q. And you can attempt correlations like that, but you realize that the accuracy is not great; correct?

A. Yes.

Q. And just so we're clear, this -- in Exhibit 8 this diltiazem level of 630 nanograms per milliliter, that is not a measurement of what Dan McCornack's diltiazem level was just prior to his death.

A. It is not.

Q. And the digoxin level of 3.6 is not a measurement of what Dan's digoxin level was just prior to his death.

A. I would be surprised if it was.

Q. More likely than not, both of those, had they been measured prior to death, would be substantially lower; correct?

MR. ERNST: Objection.

THE WITNESS: I don't know that for a fact, but I'm assuming that's what would be the case.

BY MR. MORIARTY:

Q. More likely than not that's true?

A. More -- I'm sorry. More likely than not, that's true.

Q. But you can't quantify that; correct?

A. Correct.

Q. Is there any peer-reviewed scientific literature, to your knowledge, that gives a formula for any reliable back calculating from postmortem levels to antemortem levels of digoxin?

A. I don't know if it is a reliable estimate, but what is normally done is you take some of the pharmacokinetic parameters in antemortem livers, such as volume distribution, and then measure

half life and dose and do a calculation starting with the postmortem level, trying to get an antemortem level or a dose that is given.

The problem there is that the -- the volume of distribution has a range to it. The volumes of distribution have a significant range to it. And, therefore, that's where the error comes in.

Because you end up with very low levels to very high levels, and that's why it's not very accurate.

Q. Okay. And if I remember what you told me before, you haven't published any article which contains any sort of calculations or anything like that on this subject.

A. That's correct.

Q. Have you ever told a coroner to base a cause of death solely on a postmortem blood tox screen for digoxin?

MR. ERNST: Objection.

THE WITNESS: Not that I'm aware of, no.

BY MR. MORIARTY:

Q. If you had, hypothetically, one sample, so blood drawn from one site, and no other tissue tested, and you knew that the specimen was drawn over 70 hours after death from an axillary vein, would you

counsel a coroner to base a cause of death on a postmortem blood result from that sort of draw?

MR. ERNST: Objection.

THE WITNESS: With having one sample, I would not. Unless -- unless the number was just so outrageously large.

BY MR. MORIARTY:

Q. So, hypothetically, if Dr. Mason had called you and said I'm looking at this diltiazem result of 630 nanograms per milliliter, you know, it's an axillary draw, non-ligated, over 70 hours after death.

Dr. Barbieri, do you think that I should say that this man died of diltiazem toxicity?

What would you say?

A. I would tell him probably not.

Q. Okay.

A. And I would say to him that the -- the blood serum ratio of diltiazem after -- you know, a study is around two and a half, and these levels are typical -- or that level is typical of what we see in postmortem cases and non-death cases related to diltiazem.

And it's certainly nowhere near the range in the literature of death cases caused by

diltiazem.

Q. Okay.

A. So I would say that the diltiazem could be contributory to some degree based on the history, but by itself, no way.

Q. And you'd agree with me that a digoxin level of 3.6 even in a living person who had given a serum sample is not necessarily fatal; correct?

A. Correct.

MR. ERNST: Object.

BY MR. MORIARTY:

Q. And so if Dr. Mason had called you and said, You know, Dr. Barbieri, I see your result of 3.6 nanograms per milliliter based on this specimen, would you advise him to say that Dan McCornack died of digoxin toxicity?

MR. ERNST: Objection.

THE WITNESS: I probably would not have done that.

Can I add to that answer?

BY MR. MORIARTY:

Q. Sure.

A. I think it's important for everybody to understand that people have died from digoxin at levels that were well within therapeutic range as

well.

So if he has no other pathology, you could say that certainly a level like that of digoxin could be a cause of death because people die at therapeutic levels as well.

Q. Okay.

A. Just based on that number, again, I would not definitively say that digoxin caused the death.

MR. MORIARTY: How are we doing on time?

VIDEO OPERATOR: Good. Thirty-one minutes left.

BY MR. MORIARTY:

Q. Do you still read the Journal of Analytical Toxicology?

A. Yes.

Q. Are you still a reviewer for the Journal of Analytical Toxicology?

A. Yes.

MR. MORIARTY: Why do I keep doing that?

(Exhibit Barbieri-9 was marked for identification.)

BY MR. MORIARTY:

Q. I'm handing you Dr. Barbieri Exhibit 9. This is a letter to the editor in the

Journal of Analytical Toxicology in the July/August issue of this year; correct?

A. Yes.

Q. 2011; right?

A. Yes.

Q. Do you know Fred Apple?

A. Yes, I do.

Q. Is he a reliable coroner?

MR. ERNST: I'm going to object. That's --

BY MR. MORIARTY:

Q. To your knowledge.

MR. ERNST: Object.

MR. MORIARTY: Okay. I'll withdraw the question.

BY MR. MORIARTY:

Q. What is Fred Apple's reputation in the scientific community, if you know?

A. Well, he has a -- he has a following, and he has done some very good work over the years. There are things that he has written that I completely disagree with as well.

Q. Okay.

A. But he certainly has a decent reputation as a -- as a medical toxicologist.

Q. Now, when the editors of the Journal put a letter to the editor in, do any of the reviewers, like you, get to look it over before it's published?

A. No, generally not. This is usually handled by the editorial staff.

Q. All right. Have you read this before today?

A. No. No. This is a -- this is a recent one. I have not read this -- I have not seen this one yet. I haven't opened up that July/August issue.

Q. Behind an issue or two, are you?

A. I am.

Q. Okay. Let me just ask you about a couple passages in this.

Right here in -- partway through the second paragraph it says, The scientific fact is that PMR occurs in both central (heart) blood as well as in peripheral (femoral) blood, as shown for numerous drugs in Table I.

Did I read that correctly?

A. Yes, you did.

Q. Do you agree with that?

A. Yes --

MR. ERNST: I'm going to --

THE WITNESS: I'm sorry.

MR. ERNST: -- object to this line of questioning.

BY MR. MORIARTY:

Q. Is digoxin in Table I?

MR. ERNST: Can I have a continuing objection?

MR. MORIARTY: Yes.

MR. ERNST: Thank you.

BY MR. MORIARTY:

Q. Is digoxin in Table I?

A. Yes, digoxin is listed in Table I.

Q. For both heart and peripheral?

A. That's what it says.

Q. On the second page, at the end of this paragraph that continues on from the preceding page, it says, When heart or peripheral blood is drawn -- are you with me?

A. I have it.

Q. -- it more likely than not does not reflect the blood concentration at the time of death, but reflects the combination of tissue-bound drug that has been released into the blood/fluid that is drawn at autopsy hours after death.

Did I read it correctly?

A. Yes.

Q. Do you agree with that?

MR. ERNST: Objection.

THE WITNESS: That is a -- that is a general statement for many drugs, not specific to digoxin. And so, yes, I do agree with that.

BY MR. MORIARTY:

Q. And it goes on to say, I opine that this needs to be carefully considered in cause of death determinations when interpretation of PM drug concentrations is backed by literature in support of PMR.

Did I read it correctly?

A. Yes.

Q. And do you agree with it?

MR. ERNST: Objection.

THE WITNESS: I think it's a fair statement, so I would agree with it.

BY MR. MORIARTY:

Q. It goes on to say, This is especially true in death cases in which blood concentrations may be overinterpreted as the cause of death based on the assumption that the peripheral PM blood concentration is an accurate record of the perimortem blood concentration at the time of death.

Did I read it correctly?

A. Yes.
Q. Do you agree with that?
MR. ERNST: Objection.
THE WITNESS: Yes, I do.
BY MR. MORIARTY:
Q. Do you know anything about whether Dr. Mason and his staff have the ability and skill to draw vitreous samples?
A. I don't know for sure, but I'm assuming that they do.
(Exhibit Barbieri-10 was marked for identification.)
BY MR. MORIARTY:
Q. I have marked this International Journal of Legal Medicine, year 2000, I think it's Exhibit 10, isn't it?
A. Yes.
Q. Have you ever read this before?
A. This article, no, I have not.
Q. Well, basically what they're trying to do is figure out if -- because postmortem blood is unreliable, they're questioning whether vitreous is any better.
Is that a gross description of what this is about?

A. It looks that way.
Q. Okay. And it says here, Postmortem MDMA concentrations in vitreous humor were closer to the antemortem blood levels when compared to cardiac blood samples.
Do you see that?
A. Yes, I see that.
Q. And MDMA is basically methamphetamine; right?
A. Well, it's a derivative of methamphetamine.
Q. Okay.
A. It's Ecstasy, the other name.
Q. So in the second column in the first paragraph do you see where they're footnoting 5?
A. Yes.
Under -- after femoral vein?
Q. Yes.
A. It says 5.
Q. After --
MR. MORIARTY: Do you see where I am, Don?
MR. ERNST: No.
MR. MORIARTY: Above where your pen is.
MR. ERNST: Thank you.

BY MR. MORIARTY:

Q. However, bearing in mind this general recommendation, a single blood sample is often insufficient to draw appropriate conclusions.

Another sample, tissue or fluid, should not only be used as an analytical control for the blood level determined but could also provide information on the pharmacokinetic phase and as a result the time of drug intake.

Do you agree with that?

MR. ERNST: Objection.

THE WITNESS: I don't know. I'd have to read through to understand what they're saying here --

BY MR. MORIARTY:

Q. All right.

A. -- without taking a snapshot of it.

Q. Well, the bottom line is that even your company advocates more than one type of sample for cross-checking purposes.

A. Well, that I -- that I agree with, yes.

Q. Okay.

(Exhibit Barbieri-11 was marked for identification.)

BY MR. MORIARTY:

Q. I'm handing you Dr. Barbieri Number 11.

MR. MORIARTY: Sorry, Don.

BY MR. MORIARTY:

Q. Have you ever seen this article before?

A. Yes, I have.

Q. Is it in your own archive of materials about this subject?

A. Yes, it is.

Q. So let's go to Page 237. It says Examples of drugs known to undergo PMR.

Do you see that section?

A. Yes.

Q. Digoxin is the second one listed; correct?

A. Yes. Uh-huh.

Q. And if you go to Page 238, the second column -- I'm sorry. Oh, I'm sorry. It got buried there.

VIDEO OPERATOR: Yeah, it's making a noise.

BY MR. MORIARTY:

Q. Okay. Let's go back.

I'm at Page 238 on the bottom of the left column where it says Practical implications for the medical toxicologist?

A. Uh-huh.

MR. ERNST: Uh-huh.

BY MR. MORIARTY:

Q. It says, Peripheral blood is less likely to be subject to the postmortem elevations in drug concentrations seen in central blood sources such as the heart.

Do you agree with that?

A. Yes.

Q. Further down in that same paragraph, Heart blood is probably one of the least informative areas for sampling because the redistribution of drug from the lung, liver, or myocardium affects the resulting drug concentration and, therefore, should not be used without a corresponding peripheral blood sample.

Do you see that?

A. I do.

Q. Do you agree?

A. Yeah, let me just clarify.

They're talking about concentrations found in heart blood. And that I certainly agree with.

Q. Okay.

A. Heart blood can be very informative in terms of screening a compound.

Q. Okay. In the next section, it's Alternative to blood, and they're talking about other tissues. It says, Of these, the vitreous, because of its isolation, appears to be less susceptible than blood to postmortem changes.

It is also a more simple environment than putrefied blood containing 98 to 99 percent water.

Do you agree with that?

A. Yes, I do.

(Exhibit Barbieri-12 was marked for identification.)

BY MR. MORIARTY:

Q. Dr. Barbieri, I asked this Keith Gibson a number of questions about medical literature.

Did Mr. Ernst forward to you any of the medical literature that I asked Keith Gibson about?

A. No, he did not.

Q. Have you seen this Ferner article from the British Journal of Clinical Pharmacology?

A. I don't remember this one.

Q. Okay. Well, I only want to ask you about one paragraph.

MR. ERNST: I'm going to object. He hasn't read it.

MR. MORIARTY: Okay. Your objection is duly noted.

BY MR. MORIARTY:

Q. Go to the last page. I mean the last page of the article, not the bibliography.

A. With a figure on the top?

Q. Yes, sir.

A. Okay.

Q. And when I ask you this question, I'm asking -- I want to ask you specifically in regard to a postmortem axillary vein, non-ligated specimen drawn 70 hours after death regarding digoxin. Okay?

A. Okay.

Q. Keep that in mind as I ask about it.

A. Okay.

Q. It says, There is no reliable or obvious connection between concentrations measured in life and subsequent to death.

Consequently, concentrations measured after death cannot generally be interpreted to yield concentrations present before death.

MR. ERNST: Objection.

BY MR. MORIARTY:

Q. Did I read that correctly?

A. You did.

Q. All right. Would you agree with me that that is true regarding the type of specimen that I just described?

MR. ERNST: Objection.

THE WITNESS: I would have to agree with you.

(Exhibit Barbieri-13 was marked for identification.)

BY MR. MORIARTY:

Q. I believe this is Number 13.

This is Clarke's lab manual, isn't it?

A. Uh-huh. Yes.

Q. Part of it.

A. Yes.

Q. Volume 1.

You've seen this before.

A. Well, I know the -- I know the volume.

Q. You use this?

A. Yes.

Q. So let's go to Page 96.

And, again, I was asking you earlier about whether various -- that's Page 96; right?

A. 96.

Q. Okay. I was asking you earlier about whether other matrices are good for cross-checking

your results as opposed to one sample. And I want to ask you about this vitreous paragraph. Okay?

A. Okay.

Q. About halfway through that section it says, Vitreous humor has also been used increasingly for the measurement of drugs.

Do you agree with that?

A. Yes.

Q. For example, digoxin concentrations increase markedly in postmortem cardiac blood but do not increase significantly in vitreous humor.

Do you see that statement?

A. Yes.

Q. Did I read it correctly?

A. You did.

Q. Does it come from that Vorpahl and Coe article, to the best of your knowledge?

A. Yes, it does.

MR. ERNST: Objection. Objection.

THE WITNESS: I'm sorry.

MR. ERNST: Unless there's a foundation.

THE WITNESS: Yes, it does, and I know that article.

BY MR. MORIARTY:

Q. You've read it.

A. Yes.
Q. Do you agree with the statement?
A. Yes.
Q. Therefore, vitreous digoxin concentrations give a better indication of perimortem concentrations than does heart blood.
Do you agree?
A. There's a weight of evidence that suggests that that is true.
Q. All right. And when you say --
A. Whether I -- whether I specifically agree, I'm still on the fence there. But I know that the weight of evidence is that vitreous digoxin does give a better indication of the concentrations.
Q. And when you say "the weight of evidence," you're talking about the scientific evidence.
A. Yes, I am.
Q. Let's go to Page 105, second column.
In the middle of the paragraph under Blood and/or tissue distribution.
Are you in the general area?
A. Yes, I have it.
Q. It says, While concentrations of some drugs can increase by as much as two to tenfold after

death in postmortem blood, concentrations in tissues such as liver remain relatively stable.

Do you agree with that?

A. Well, the first part of the sentence I do agree with. I mean, tricyclic antidepressants, for example, can go up to 15 times.

Concentrations in liver being relatively stable, I don't know the answer to that, whether I agree or not.

Q. All right.

A. I think it largely depends upon where the section of the liver is taken from --

Q. Okay.

A. -- which can definitely lead to concentrations.

Q. Have you read articles about digoxin in which they talk about that drug undergoing PMR by two to tenfold after death?

A. No.

Q. At Page 106 in the second column, the last sentence in that carryover paragraph --

A. Here (indicating), okay.

Q. Right there.

It says, In most instances, pharmacokinetic calculations using postmortem blood

measurements are rarely defensible forensically.

Do you agree with that?

MR. ERNST: Objection.

THE WITNESS: Well, this is -- this is pretty clear to say that you can't really defend it. You can defend with the calculations that one makes and with all the caveats associated with them, as I tried to explain before.

So I would say that I'm not going to, you know, say that this is not true because I think you can defend what you've done, but the calculations are suspect.

BY MR. MORIARTY:

Q. Are you telling me that you can defend what you've done, but the results aren't necessarily accurate?

A. That's true.

MR. ERNST: Objection.

THE WITNESS: Yes.

(Exhibit Barbieri-14 was marked for identification.)

BY MR. MORIARTY:

Q. Okay. Let's look at Exhibit 14, which is Volume -- from Volume 2 of Clarke's.

This is the monograph on digoxin, is it

not?

A. Yes.

Q. And if you go to Page 918, under Disposition in the body, it says, Digoxin is rapidly distributed throughout the body and less than 20 percent of the total digoxin in the body is located in the blood.

Do you see that?

A. Yes.

Q. Do you agree?

A. Yes.

Q. Is that similar to what Baselt is saying in his book?

A. Yes.

Q. And then it says, High concentrations are found in the heart, brain, and kidneys, but the skeletal muscles form the largest digoxin store.

Did I read that correctly?

A. Yes.

Q. Do you agree?

A. Again, we talked about this, and that's true not on a concentration basis but on a total body load.

Q. All right. And is it consistent with Baselt's text?

A. Yes.

Q. Now, under Therapeutic Concentration it says, In serum usually in the range of 1 to 2.5.

Now, that's micrograms per liter; correct?

A. Yes.

Q. Okay.

(Exhibit Barbieri-15 was marked for identification.)

BY MR. MORIARTY:

Q. Here is Exhibit 15, the Cook and Braithwaite article from the Journal of Clinical Pathology.

Have you ever seen this before?

A. Yes, I have.

Q. Is it in your archive of scientific materials regarding digoxin?

A. I don't know if I saved this one. This goes back, you know, many years.

Q. But you've read it.

A. But I have read it.

Q. Okay. All I want to ask you about is the last paragraph of the article. It begins by saying, Our study shows that a high degree of error can arise from attempting to predict antemortem

concentrations from postmortem concentrations --

MR. ERNST: I'm going to object.

MR. MORIARTY: What's the matter?

It's the last paragraph of the article --

MR. ERNST: I object. It's -- you're talking about a whole range of drugs. I object.

MR. MORIARTY: Okay. I just -- I didn't know if you were in the right place.

Let me start over --

MR. ERNST: Yeah, I'm in the right place. I just -- it's an improper cross-exam. I object.

BY MR. MORIARTY:

Q. Okay. Let me ask you about this last paragraph.

It says, Our study shows that a high degree of error can arise from attempting to predict antemortem concentrations from postmortem concentrations and emphasizes the need for continued research into this area of pathology practice.

In the absence of such data, estimates of circulating drug concentrations during life should not be made.

First, did I read it correctly?

A. You did.
Q. Second, so far as digoxin is concerned, do you agree with that?
MR. ERNST: Objection.
THE WITNESS: Well, certainly the beginning in terms of the high degree of error can arise, and I've stated that before today. So I certainly agree there.
And they're saying definitely the circulating concentrations should not be made. There may be some utility in calculating a concentration, especially if their levels are significantly greater than what one would expect.
So I don't know if I agree with that second sentence because I think there may be some utility at least getting ballpark numbers to look at -- and what -- what we have.
Again, realizing all the caveats that I've talked about.
BY MR. MORIARTY:
Q. Sure.
You wouldn't do it as a forensic toxicologist based on a 3.6 postmortem Dig level drawn under these circumstances, would you?
A. No --

MR. ERNST: I'm just -- objection.

What was the -- I didn't -- it was an incomplete question.

MR. MORIARTY: Can you read my question back.

(The court reporter read back the following:

"Q. Sure.

"You wouldn't do it as a forensic toxicologist based on a 3.6 postmortem Dig level drawn under these circumstances, would you?")

MR. MORIARTY: And what was his answer?

(The court reporter read back the following:

"A. No --")

THE WITNESS: No, I didn't answer.

COURT REPORTER: I'm sorry. There was an objection, and he was interrupted by the objection.

BY MR. MORIARTY:

Q. Did you answer my question?

A. No, I started but I didn't answer.

COURT REPORTER: Right.

BY MR. MORIARTY:

Q. Answer my question.

A. Okay.

MR. ERNST: My objection stands.

THE WITNESS: Okay. As I said before, I would not do it with digoxin in this case.

MR. MORIARTY: Okay.

(Exhibit Barbieri-16 was marked for identification.)

BY MR. MORIARTY:

Q. I'm handing you Dr. Barbieri Number 16. I'm going to try to get this question in before the break.

Go to Page 541.

Have you seen this article, by the way?

A. Yes, I have.

Q. Read it?

A. Read it. Saved it.

Q. Under Practical Consequences in Forensic Toxicology, it says, From practical -- From a practical point of view, the respect of some precautionary measures can limit misinterpretations.

Do you agree with that?

A. Yes.

Q. It is very important in postmortem testing to be able to compare concentrations in several blood and tissue samples even if reference values for drug concentrations in tissues are often

missing.

MR. ERNST: Objection.

BY MR. MORIARTY:

Q. Do you agree?

A. I do.

Q. Okay. That's all I want to ask you about this.

We have to take a five-minute break. When we come back, I will be able to wrap this up within 15 minutes or so.

VIDEO OPERATOR: Going off the record at 12:50.

(A recess was taken from 12:50 to 12:59 p.m.)

VIDEO OPERATOR: We're back on the record at 12:59.

You may proceed.

BY MR. MORIARTY:

Q. Dr. Barbieri, do you use Flanagan's toxicology book in your practice at all?

A. No, I don't.

Q. I'm just trying to get through these articles and see if I need to ask you about them.

Are you familiar with Graham Jones?

A. Yes.

Q. What's his reputation in the toxicological community?

A. Excellent.

Q. Have you read any of his books or articles?

A. Yes, I've read several -- several of his articles.

(Exhibit Barbieri-17 was marked for identification.)

BY MR. MORIARTY:

Q. Well, let me ask you about Barbieri Exhibit 17, which is a chapter from a book called the Postmortem Toxicology of Abused Drugs by Karch.

Do you have that book?

A. It's on -- it's on -- it's not my book, but it's on our shelves, yes.

Q. Do you ever refer to it?

A. Once in a while.

Q. Is it considered pretty reliable?

A. There's good things and bad things about it.

Q. All right. Let me ask you about Graham Jones' chapter in particular called the Interpretation of Postmortem Drug Levels. All right?

A. Uh-huh.

MR. ERNST: I will object. There's no foundation.

BY MR. MORIARTY:

Q. All right. So let's go to Page 115.

Do you see that section called Postmortem Specimens?

A. Yes.

Q. It says, Relying on a toxicology result from a single specimen can be misleading because of the postmortem changes that can occur.

Do you agree with that?

A. Yes.

MR. ERNST: Objection.

BY MR. MORIARTY:

Q. The last sentence in that section, it says, It is good forensic practice to have multiple specimens available or at least blood specimens from different sites in the body because of the potential difficulties in interpreting postmortem toxicology results.

Do you agree with that?

MR. ERNST: I will object.

THE WITNESS: Yes, I do.

BY MR. MORIARTY:

Q. So on the next page, at the end of that

-- at the end of the section before Vitreous, it says, Since blood concentrations of some drugs have the potential for marked postmortem change, it is good practice to analyze blood obtained from more than one site, plus tissue or other specimens where this may be useful.

MR. ERNST: Objection.

BY MR. MORIARTY:

Q. Do you agree?

A. Yes. In general, yes.

Q. And in the section on Vitreous, which is one of these alternative specimens that they're talking about, the second sentence says, However, vitreous humor has also been useful for a number of drugs.

For example, it is well known that digoxin concentrations will rise after death in cardiac blood, due to postmortem redistribution from myocardial tissue, and possibly other organs.

Consequently, vitreous digoxin concentrations are more likely to reflect those in antemortem plasma.

Did I read it correctly?

A. You did.

Q. Do you agree?

A. I do. And that -- that references again to Vorpahl and Coe.

Q. Okay. So if we go back to Page 123, there is a section called Estimation of Amount Ingested from Blood Levels.

Do you see that?

A. I have it.

MR. ERNST: I'm going to object. Objection.

BY MR. MORIARTY:

Q. The first sentence --

MR. ERNST: Can I have a continuing objection to this entire article?

MR. MORIARTY: Yes.

MR. ERNST: Thank you.

BY MR. MORIARTY:

Q. Given the foregoing discussion, it should go without saying that using pharmacokinetic calculations to try to estimate dosage given a postmortem blood concentration is of virtually no value and can be extremely misleading.

Do you agree?

A. No.

Q. Okay.

A. I don't.

Q. Why?

A. Well, it can be misleading, and, as I stated before, I think there may be some benefit to knowing ballpark numbers and ballpark estimates. So to say it's no value I think is very strong.

Q. Yeah, but here they're talking about dose ingested, not the antemortem level.

A. Well, I know that. But you can do the calculation -- you can reverse the calculations and get the dose back.

Again, the -- based on the caveats it talked about before, there can be a wide range between those.

Q. Okay.

A. And though, in some respects, at least in his respect, he says it's of no value, I think there is some value to at least get a ballpark estimate of where you are.

Q. All right. But you wouldn't do it in this case.

A. In this particular case --

MR. ERNST: Objection.

THE WITNESS: I'm sorry.

In this particular case I think we're dealing with a drug that should not be estimated

levels.

MR. MORIARTY: All right. Okay.

(Exhibit Barbieri-18 was marked for identification.)

BY MR. MORIARTY:

Q. Okay. Let's ask you about Dr. Barbieri Number 18.

Have you read any of Gideon Koren's work on postmortem redistribution of digoxin?

A. No, I haven't.

Q. Are you sure?

A. I'm pretty sure.

Q. Okay.

A. I know Dr. Koren's work from his work on alcohol and cocaine, but I don't remember reading anything on digoxin.

Q. All right. What is his general reputation in the scientific community?

A. It's very good.

Q. So as you can see from the abstract, they actually had some patients in whom they had -- did some studies; correct?

A. Yes. It states here 47 children.

Q. Okay. So let's go to the left column of the first page of this, which is Page 1210.

It says, However, excessive serum concentrations of the cardiac glycoside should not automatically be interpreted as reflecting toxicity.

Do you agree?

A. I do.

Q. Let's go back to Page 1212.

MR. ERNST: Just a minute.

There's no foundation for this. Continued objection.

Is that agreed, Counsel?

MR. MORIARTY: Yes, you can have a continuing objection.

MR. ERNST: Thank you.

BY MR. MORIARTY:

Q. Let's go to the last sentence on the page.

An attempt to prove digoxin intoxication as a cause of death may be hampered by the fact that postmortem levels may be 1.5 to ten times higher than antemortem levels.

Do you see that?

A. I do.

Q. Do you agree?

A. Well, I certainly agree that trying to produce -- to prove digoxin intoxication as a cause of

death may be hampered.

Q. Okay.

A. That postmortem levels are this range, I don't have any basis for that, so I can't agree to the numbers.

Q. Are you --

A. But in terms of the general statement, yes, I agree.

Q. Are you saying you have no basis because you haven't done the experiments?

A. I don't have enough data to make a determination that it's going to be 1.5 to ten times higher than antemortem.

Q. Okay. And have you read enough literature to know whether this is contained in the greater body of literature on this subject?

A. To go up to ten times higher? I don't believe so.

Q. All right.

A. In the lower range I would say we're probably closer to it.

Q. Okay.

MR. MORIARTY: Okay, everybody, we have to take a time-out.

VIDEO OPERATOR: Let's go off the record

at 1:09.

(A recess was taken from 1:09 to 1:11 p.m.)

VIDEO OPERATOR: We're back on the record at 1:11.

You may proceed.

MR. MORIARTY: Thank you.

(Exhibit Barbieri-19 was marked for identification.)

BY MR. MORIARTY:

Q. Okay. Let me ask you about Dr. Barbieri Number 19.

Do you know who Derrick Pounder is?

A. Yes.

Q. What is his reputation in the scientific community?

A. It's very good.

Q. And this is from I think Cyril Wecht's pathology text.

Yes. Legal Medicine, 1993, Cyril Wecht, M.D., J.D. He's a coroner from Pittsburgh --

A. I know him.

Q. -- for many years.

A. I know Dr. Wecht.

Q. Is he still practicing?

A. Yes.
Q. Amazing.
Have you ever seen this book?
A. No, I haven't.
MR. ERNST: May I have a continuing objection?
MR. MORIARTY: Yes, you can.
BY MR. MORIARTY:
Q. Have you ever used it?
A. No.
Q. Let me ask you just a few questions from it.
In the beginning they're talking about the purpose of postmortem analysis for drugs; is that right?
A. Yes.
Q. And then a couple sentences down it says, In all of this there is an underlying presumption that drug concentrations in blood and other biological fluids and tissues remain constant in a corpse, whatever the delay between death and the collection of samples.
In recent years it has become increasingly clear that for most drugs, this presumption is false.

Do you agree with that?

A. I do.

Q. Turn, please, to Page 175.

It's -- Page 175, it's the second full paragraph.

A. Okay.

Q. And it talks about diltiazem and digoxin.

Do you see that?

A. Yes.

Q. Can you just read that paragraph to yourself. It starts with Drug concentrations in cardiac blood, and ends with is the likely mechanism.

A. (Witness reviews document.) Okay, I've read it.

Q. Do you agree with it?

A. Well, again, I have to -- I have to take him at his word that -- the last thing about 30 times that of blood. But it wouldn't be unusual coming from cardiac blood -- I'm sorry -- coming from myocardium, the cardiac blood to be that high.

Q. Okay.

A. So in general, yes, I do agree with the paragraph.

Q. Got it.

And then if you go to the next page, 176, the first full paragraph begins with One approach to the problem of postmortem drug changes in blood has been to look for alternative or corroborating tissues for analysis.

You agree with that, don't you?

A. Yes.

Q. And, lastly, please go to Page 187.

The last paragraph, In conclusion.

A. Okay.

Q. Do you see that?

A. Uh-huh.

Q. The second sentence says, For interpretive purposes, the ideal toxicological sample is a peripheral blood specimen obtained from a ligated vessel immediately after death.

Do you agree with that so far?

A. Yes.

Q. Then it goes on to say, All autopsy samples fall short of this ideal, but the more they do so, the more contentious will be the interpretation of the analytical results.

Do you agree with that?

A. I do.

MR. MORIARTY: Do you want to break and

talk or just go?

MS. DONAHUE: Just go.

MR. MORIARTY: Okay. I am going to pass the witness.

Did I give you a copy of this?

MS. DONAHUE: No.

Thank you.

I think I need your microphone.

VIDEO OPERATOR: Yes.

MS. DONAHUE: Thank you.

EXAMINATION

BY MS. DONAHUE:

Q. I guess it's afternoon now, so good afternoon, Dr. Barbieri.

A. Good afternoon.

Q. I just have a few short follow-up questions for you.

I introduced myself off the record, but my name is Alicia Donahue and I represent the Mylan defendants in this case.

A. Okay, Alicia, thank you.

Q. Thanks.

Let's see. You talked a little bit about the various conversations you had with Mr. Ernst and his partner on the case.

How much time in total have you spent working on this case, preparing for deposition?

A. Not a lot at all. I spent about an hour -- other than the phone calls, which in total was about an hour or so.

Q. Uh-huh.

A. I spent about an hour yesterday going through the litigation package. I had reviewed it very briefly after our first conversation when I obtained the records, just to get a feel for the case. So that's about it.

Q. Okay. And what is your -- what are you charging Mr. Ernst per hour for doing that work?

A. I believe it's 400 an hour. But I don't -- I don't handle that, so I'm just guessing on that.

Q. So as you sit here today, do you have any idea in your mind about how much has been billed for your time spent on this case to date?

A. Nothing has been billed so far.

Q. Do you have an estimate as to how much that bill would be based on the time you've spent to date?

A. It's probably going to be somewhere around four hours' worth of time. Assuming we're here for a couple hours now, so we're already three-plus

hours into it.

Q. Okay.

A. It depends how long it goes obviously.

MR. ERNST: That includes this deposition?

THE WITNESS: It includes that, yeah.

BY MS. DONAHUE:

Q. All right. In regard to what has been marked as Exhibit 4, which is the expert disclosure in this case, and that you were asked questions about that earlier, you mentioned -- and I'm just paraphrasing -- but you mentioned talking to Mr. Ernst and telling him that you objected to one of the statements in Exhibit 4?

A. Well, I -- it wasn't just one --

Q. I hand that to you.

A. -- it wasn't just one of the statements. It was the -- the whole tenure of the statement of what I would testify to.

Q. And that's my question. Can you tell -- can you elaborate for me what exactly your objections were to Exhibit 4?

And first let's start by telling -- telling me, when did you tell Mr. Ernst you had objections to Exhibit 4?

A. It was a couple weeks after the first conversation that we had.

Q. And can you give me a time frame of when that occurred?

A. I probably have a specific date.

Q. If you refer to the phone log --

A. I don't have the --

Q. -- would that be helpful?

I'll give you back the exhibits. I think the phone log is in there.

A. No, it would not be in here. Let's see.

(Witness reviews documents.) Well, this isn't -- this isn't specific as to when we spoke. But it was certainly in the range of June the 8th to the 16th, somewhere in that area.

Q. Thanks.

All right. So then getting --

A. And my objection was that -- well, how this came about -- again, as I think I tried to explain before -- I was very confused after our first initial conversations about why I was being deposed because I knew that this package had been done before by Matt McMullin.

And so I -- we contacted Mr. Moriarty's office to get a clarification of did he really want me

to testify on this case because I didn't know if I could really add to what was presented previously.

And then he sent me back a deposition -- the beginning of the deposition notice with just Pages 9 and 10 of this document.

And I read through this and basically I took it as the Ernst law firm made a decision that I would be talking about causation and all these things and distribution and toxicity and et cetera.

And I -- I had no knowledge of this specific case, as I tried to explain. And so I got quite upset because this is not normally what I see.

Usually people will contact me ahead of time and say, Here's what we want to talk about. Here's what I'm going to write out. I'm going to send you a copy of this and we'll go over it.

This was brand new to me. And so I basically hit the ceiling.

Q. And?

A. And so I contacted his office and let him know that I was very unhappy about what happened -- what transpired.

He then -- through missing some phone calls back and forth, we eventually hooked up and he was very, very cordial and very apologetic and tried

to explain to me what this was about and that this was their best attempt prior to contacting me as to what I may be testifying to.

And so I took him at his word and I accepted his apology and I said, We're just going to move forward on that.

Q. You talked about what you're used to and what normally happens in situations like this, and that would be that you would have been contacted prior to the disclosure being served.

A. Yes.

Q. That's been your experience in the past.

A. Yes.

Q. And that did not occur in this case.

A. No, it did not.

Q. And you never discussed with Mr. Ernst or anyone in his office prior to May 15th -- or May 16th of 2011 any of the opinions that are reflected in the disclosure as those that you would provide in this case.

A. That's correct. I had no -- no contact with his office at all.

Q. And the fact of the matter is, I believe your testimony today is that you do not intend to

render any opinions, any expert opinions, in regard to this case, other than the methodology that your lab uses and the findings of your lab in regard to the blood tests performed on the sample.

MR. ERNST: Objection. He already has.

THE WITNESS: Well, I've rendered some opinions based upon digoxin in general. And I tried not to be specific with the case, but obviously the question was focused on the level.

And so I didn't want to. And -- but circumstances, I tried to answer honestly.

BY MS. DONAHUE:

Q. You do not intend to render any opinions in this case in regard to the cause of Mr. McCornack's death; is that correct?

A. No, I do not.

Q. Nor any opinions in regard to the liability of any of the defendants for that death.

A. That's correct, I will not.

Q. When you had your conversation with Mr. Ernst where you said you were pretty upset after reviewing the disclosure that's been marked as Exhibit 4, did he tell you why he didn't contact you prior to serving the disclosure and discuss your testimony with you?

A. I don't know the exact words he used, but the -- what I got out of it was they were moving forward with this case, they wanted me eventually to testify, and whether it was an oversight on their part -- I don't know the specifics of it -- but they did their best in terms of putting down what they thought I would testify to.

That's what I got out of it.

Q. Did any -- is there any reflection in your records, Doctor, that anyone from Mr. Ernst's office attempted to contact you and discuss the opinions and testimony that's referenced in Exhibit 4 as testimony that you will provide, prior to serving it on May 16th, 2011?

A. No.

MS. DONAHUE: That's all the questions I have. Thank you very much.

EXAMINATION

BY MR. ERNST:

Q. Good morning, Doctor.

A. Good morning.

Q. We should clarify a number of things here.

Doctor, looking at what has been previously marked as Exhibit Number 8, would you look

at that document for me, please.

A. Yes.

Q. And what is it, please?

A. This is the second report that I generated based on the blood testing for Daniel McCornack to the Santa Cruz County coroner.

Q. And did you sign that document?

A. I did.

Q. Are you the person that is mentioned as the individual that supervised the test for the digoxin on the blood sample taken from Mr. McCornack after his death?

A. No. I did not supervise the testing for digoxin.

Q. Did you sign Exhibit 8?

A. I did.

Q. And your purpose in signing it was what?

A. My purpose in signing it is that I reviewed all the data.

Q. I see. I'm sorry.

A. I reviewed all the data. As I said before, some of it original, some of it not.

The digoxin level I did not review the original data, but it was on the computer, and I published the results based upon what the laboratory

staff did and the review of that data.

Q. How long have you worked for NMS?

A. Almost 13 years.

Q. Now, is your name on this -- is yours the only name on this report as the -- having signed the report with the digoxin level of 3.6?

A. That's correct.

Q. Circling back, looking at your CV, which has been marked as Exhibit 1, I want to just take you through a couple of things.

A. Okay. Certainly.

Q. Doctor, do you have a Ph.D.?

A. I do.

Q. In what?

A. Pharmacology.

Q. And you received that from where?

A. The Philadelphia College of Pharmacy and Science.

Q. And when was that?

A. 1976.

Q. And you did your undergraduate study where?

A. My undergraduate was at the same college. I have three degrees from the same institution.

Q. And those three degrees are?
A. Bachelor of Science in pharmacy, 1970; a Master's in Science in pharmacology in 1972; and my Ph.D. in 1976.
Q. And you have testified as an expert in toxicology many times, both in criminal cases and in civil cases?
A. Yes.
Q. And Exhibit 8 was generated by NMS, your employer, and you in this case; true?
A. Yes.
Q. Does it accurately reflect the testing that was done by NMS?
A. Yes, it does.
Q. And was the testing by NMS done in a scientifically appropriate fashion?
A. Yes, it was.
Q. And you can testify as the person who signed the report that, in fact, that testing was done in an appropriate scientific fashion?
A. Yes. Yes, I do.
Q. And does Exhibit 8 accurately reflect the findings of that -- of those tests?
A. Yes, it does.
Q. Now, looking back at the report, Doctor,

you're aware that Mr. McCornack died on March 23rd, 2008?

A. Yes.

Q. And that --

A. That's not from the report. That's from other documents in the folder.

Q. In the file.

And when you were first contacted by me, it was relayed to you that you were a non-retained expert; true?

A. Yes.

Q. And, in fact, I told you that I just wanted to have you testify about what you know, what you knew, what you thought about the testing procedure that was done and any ramifications about that; true?

MS. DONAHUE: Objection.

MR. MORIARTY: Objection. Leading. And I'll take a continuing objection to leading your own expert --

MS. DONAHUE: Join.

MR. MORIARTY: -- if you don't mind.

MS. DONAHUE: Join. Join.

MR. ERNST: Actually, I might want to use this deposition testimony, so I would appreciate if you would ask -- or just make the objection so that

if there is a problem, I will be able to cure it. Okay?

MR. MORIARTY: Sure.

BY MR. ERNST:

Q. Doctor, did we discuss that I wanted to have you testify with having not reviewed any particular documents of this case, just about what you know or have observed and understood about the testing procedures by NMS?

A. You did.

Q. And there was some confusion about when you were designated as an expert.

But apparently you contacted Mr. Moriarty's office and asked about why you were being deposed?

A. Yes.

Q. And did you speak with Mr. Moriarty at the time?

A. No, I spoke with no one.

Q. All right. And thereafter you were sent a disclosure.

A. Yes.

Q. And after the disclosure was sent, you and I had a conversation where, if there was miscommunication, we both sort of apologized and said,

look, I just want to know what's in your mind as a toxicologist when these tests were performed.

A. Yes, that --

MS. DONAHUE: Objection. Leading.

THE WITNESS: -- that is fair and accurate.

BY MR. ERNST:

Q. Did I ask you -- did I indicate to you that during your deposition we would just be asking you what you know and understood about the testing procedures and any ramifications that you might have from that?

A. I think you phrased it as some hypotheticals that may come up. But, yes, we did.

Q. Okay. Now, one of the things that I want to ask you about, and I have a hypothetical, but before I get there, I want to ask about the testing of digoxin.

NMS regularly tests for digoxin if they are asked to do so.

A. Well, we will test for digoxin if we're asked to do so. It's not necessarily on a regular basis. We don't have a regular digoxin test we run every day. But we will test for digoxin as requested.

Q. And in this particular case, what client

requested that you test for the digoxin?

A. It came from the office of the Santa Cruz County coroner.

Q. Now, just in reviewing the document, do you know why the request to review digoxin came at this particular date?

A. No, other than from the phone log notes, there was a conversation from a Sergeant Burt, I believe, who actually made the request.

Q. I want you to -- I want to talk about the 3.6 number.

Taken by itself with a digoxin level of 3.6 postmortem, does that mean anything to you as a toxicologist?

A. Well, 3.6 in the broad scope of things for a postmortem blood sample is not exceedingly high.

If this were an antemortem serum or plasma sample or even a whole blood sample that was taken antemortem, this would -- as I explained to you, this would be higher than the typical therapeutic concentration that one may see.

Q. It would give you concern as a toxicologist.

A. Well, it would certainly, you know, raise a flag, again, depending on what the sample was,

when it was taken, how it was taken, et cetera. But it's nothing to turn around and say, Ignore it.

Q. Right.

You would want to do something with it as a toxicologist.

MR. MORIARTY: Objection.

MS. DONAHUE: Objection.

THE WITNESS: No, that I can't state I won't do something with it. We did something with it. We published the number.

BY MR. ERNST:

Q. Now, I want to ask you -- I'm going to ask you a hypothetical question, and I have some things that I want you to assume. And there's going to be a list of them, so I want to make it clear.

A. Okay.

Q. I want you to assume that this blood sample was taken from Dan McCornack who was 45 years old at the time of his death.

I want you to assume that his kidney function was normal.

I want you to assume that he weighed approximately 220 pounds.

I want you to assume that he was taking a 0.25 Digitek tablet twice per day, once in the

morning and once in the evening with his evening meal, and at breakfast.

I want you to assume that he was regularly tested for digoxin levels by his treating physician, that he had been taking digoxin for approximately 15 to 20 years, and in the previous year he'd been tested and his digoxin level was 1.6.

I want you to assume that he was tested -- and the 1.6 was from May 15th of '07 and his blood was 1.6 nanograms per milliliter.

I want you to assume that he was taking his medication in an appropriate and compliant fashion.

I want you to assume that a family member saw him take his medication, digoxin, the evening of March 22nd, 2008, at approximately 6:00 to 8:00 p.m.

I want you to assume that his digoxin medication was in a pill dispenser for which he had his pills segregated to take.

I want you to assume that he was with four other families on a Easter trip camping in Big Sur in a motor home.

I want you to assume that he had been compliant in his medication, taking his medication,

and the doctor, his treating doctor, had so testified.

I want you to assume that his wife was awakened by him at 12:30 a.m. on March 23rd, 2008, by his snorting and inability to breathe.

I want you to assume that his wife began CPR, called 911, and that the rescue personnel arrived and he was pronounced dead at 12:52 a.m. on March 23rd, 2008.

I want you to assume that an autopsy was done on March 26th, 2008, at 7:30 a.m.

And I want you to assume that blood was drawn from a peripheral limb, that means an axillary vein of the arm.

And I want you to assume that the coroner that took the blood cut the axillary vein and pressed the blood out from the wrist of the arm down into the pooled area where he -- it was picked up.

I want you to assume that at the time of his autopsy, the doctor opined that the death was cardiac arrest due to ventricular arrhythmia due to atrial fibrillation due to hypertensive arthrosclerotic cardiovascular disease.

And I want you to assume that thereafter, on or about May 2nd, 2008, a -- there was a recall of the drug that Mr. McCornack was taking --

taken, in Digitek, and that recall was dated early May 2008, some five weeks after he died.

And thereafter, and only thereafter, did Dr. Mason, the coroner, request digoxin test on the blood of Mr. McCornack.

That blood was in the custody and control of NMS, and that test that was performed on the digoxin was the test that you have in front of you, Exhibit 8.

Thereafter, the coroner reviewed the medical records of Mr. McCornack from his treating physician as well as his cardiologist and only after review of all that material the coroner changed the death certificate listing the cause of death to be cardiac arrest due to ventricular arrhythmia due to digoxin toxicity due to digoxin poisoning.

If all of these facts that I have given you are accurate, would the blood level of 3.6 be consistent with digoxin toxicity, digoxin poisoning that could lead to cardiac arrest due to ventricular arrhythmia?

MS. DONAHUE: Objection.

MR. MORIARTY: Objection. Form and otherwise.

Go ahead.

THE WITNESS: Possibly. Though I can't state that with any kind of scientific certainty.

BY MR. ERNST:

Q. Right.

I am asking you as a forensic toxicologist to go back to Exhibit 5.

And on Exhibit 5, which you indicated you were familiar with, which is the AHFS Drug Information, there's a statement that reads, on Page 1729, Serum concentrations of digoxin should be interpreted in the overall clinical context.

All right. That's what it says. But the language that is also present is, In adults, toxicity is usually, but not always, associated with steady-state plasma digoxin concentrations greater than 2.0 nanograms per milliliter.

Is that true?

A. Yes, what page are you on, just to --

Q. 1729.

A better question is, Doctor, it's true that steady-state plasma concentrations greater than 2.0 nanograms per milliliter are generally considered toxic; true?

MR. MORIARTY: Objection.

THE WITNESS: Well, again, not

necessarily. I mean, this statement is true as it's written.

Again, it says toxicity is usually, but not always, associated with Dig concentrations greater than 2.0 nanograms per mL. That is a true statement. Okay?

Now, again, there are -- there are individuals who have levels of -- these are -- antemortem therapeutic levels of digoxin above 2.0 nanograms per mL that are surviving as we sit here today.

There are also individuals who have levels below 2.0 nanograms per mL of digoxin in their serum that have died from digoxin.

So the therapeutic index of digoxin, which means the ratio between the toxicity and the -- the therapeutic level of digoxin, is very low.

And it is a dangerous drug. And in an individual who has cardiac problems, it can be a lifesaving drug and at the same time it can be a drug that can cause problems.

So in answer to the hypothetical that you gave me, I'll restate that, yes, it is certainly possible that digoxin was involved in his death.

And it's also likely or it's possible

that digoxin had no role in his death, that his pathology caused that.

BY MR. ERNST:

Q. Just -- but you don't have an opinion on that. You just have -- I'm asking about the 3.6 level.

A. I understand that.

Q. So the 3.6 level is what you've termed a starting point.

A. Yes.

Q. Now, I want to go back and talk about the test for a moment. And this is Exhibit 8.

A. Yes, it is.

Q. And everything in Exhibit 8 is true and accurate according to what you are testifying here today and what you know; true?

A. Yes, it is.

MR. ERNST: Counsel, I would move Exhibit 8 into evidence.

Do you have any objection?

MR. MORIARTY: Yes.

MS. DONAHUE: Yes.

MR. ERNST: And would you state your objection for the record.

VIDEO OPERATOR: Could you put the mic